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Determination of the Difference of Longitude between Frankfort-on-the Maine and Berlin by Means of Galvanic Signals.[*] By M. Encke.

The two extreme stations were Paul's Tower, Frankfort, and the new Observatory, Berlin. M. Encke and Dr. Brünnow observed at the latter station, and Dr. Lorey at the former. The telegraph apparatus used is Morse's. It was agreed that Dr. Lorey should decide in every case upon the day for making the experiments, in order that he might be enabled to determine the time with accuracy. He was then to announce by a signal that the experiments were about to commence, and after this note of preparation he was to make a series of signals during the next ten minutes, it being arranged that he was to make a new signal about the beginning of each successive minute. M. Encke observed the corresponding time at the Telegraphic Office, Berlin, upon a chronometer by Tiede, which was regulated according to mean time; Dr. Brünnow made similar observations with a chronometer by Tiede regulated to sidereal time. The ten signals being observed, Dr. Brünnow gave a signal from Berlin to announce that a new set of experiments was about to commence, and this was followed by ten successive signals as before. The time was observed in this case by Dr. Lorey at Frankfort, and by M. Encke at Berlin. Since the time of each approaching signal was known within a few seconds, the observer could wait for its actual arrival with unremitting attention.[†] In this way all went on quickly and without any disturbance. Only on the second day was the last signal imperfectly observed. M. Encke then gives the details of the observations. The following are the final results for the longitude of Frankfort west of Berlin :—

Signals from Frankfort.

	m s	m s
Aug. 12	18 51·99 E	18 51·72 B
28	51·71	51·85
	18 51·75 E	18 51·79 B

Mean $18^{m}\ 51^{s}{\cdot}77$

Signals from Berlin.

	m s	m s
Aug. 12	18 51·57 E	18 51·93 B
28	51·91	52·13
	18 51·74 E	18 52·03 B

Mean $18^{m}\ 51^{s}{\cdot}89$

or, on the whole, a mean difference of longitude amounting to $18^{m}\ 51^{s}{\cdot}83$. The difference of the two results cannot arise from the circumstance that the transmission of the signal is not instantaneous, since, during the interval of transmission, the Frankfort signals ought to have arrived too late at Berlin, in which case the

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[*] *Ast. Nach.* No. 889.

[†] Mit gespannter aufmerksamkeit.

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difference of longitude should have turned out too great, while again the Berlin signals, by arriving too late at Frankfort, should have indicated the difference of longitude to be too small. In reality, however, the Berlin signals made the longitude west *greater* than its true value. These two experiments, consequently, indicate that, as regards the means of observation herein employed, the velocity of the electric current is insensible for the distance between Frankfort and Berlin, a distance which, taking into consideration the circuitous route of the telegraph, certainly exceeds 60 German miles.

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